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The Air Line Pilot

December, 1955

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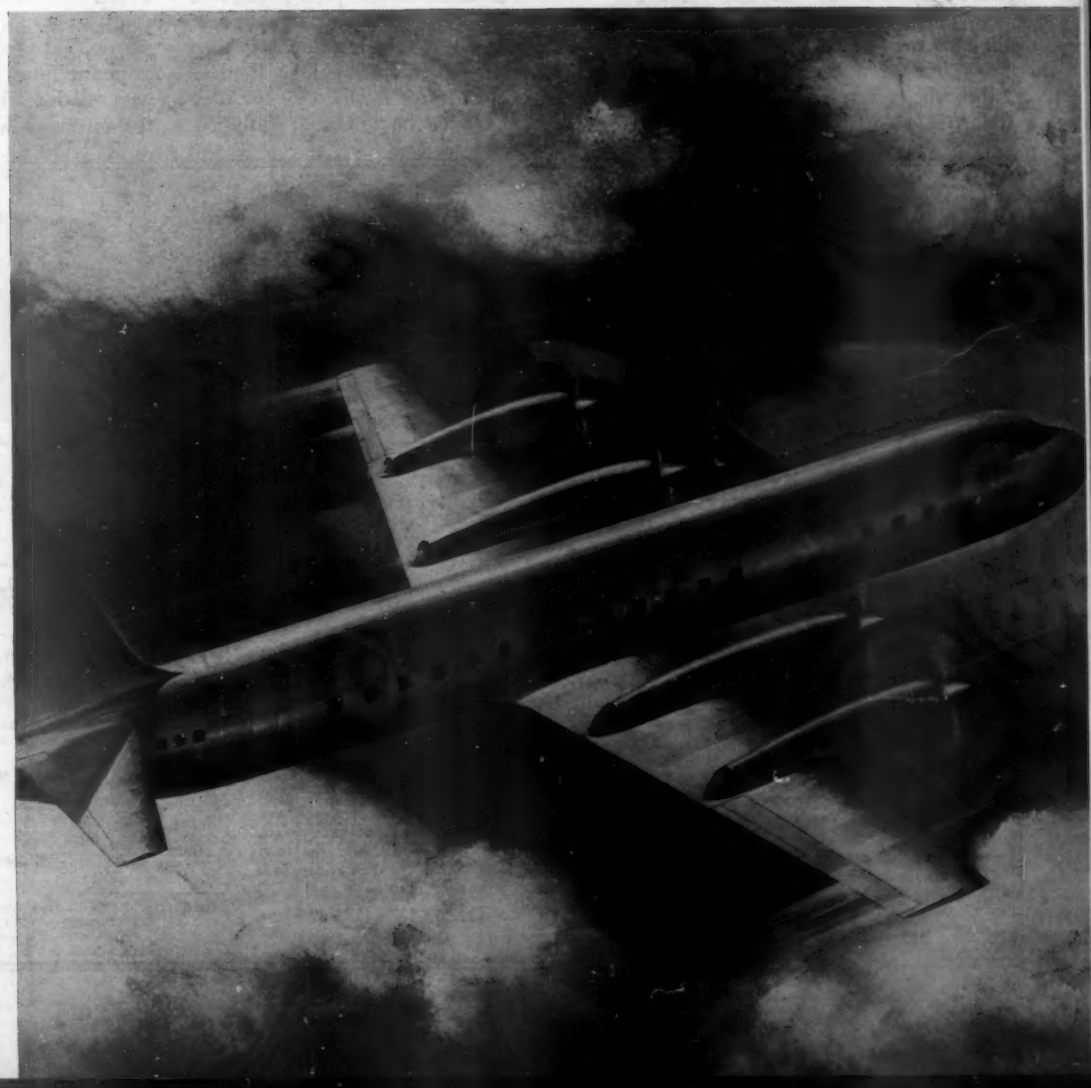

The Electra —Page 4—

Air Line Pilot--Professional Man

The Qualifications, Which Define Today's Air Line Pilot Are, In The Final Analysis, Those Of A High-Caliber Professional Man That Go Deeper Than Mere Job Performance

By Capt. F. E. W. Smith
Canadian Air Line Pilots Assn.

What follows hereafter is not of a technical nature, being instead an attempt to delve into the abstract features of the occupation of an air line pilot. And it is earnestly hoped that the result will be a worth-while contribution to the profession, helping to give a broader viewpoint to pilots, to deepen their perspective beyond flat dimensions and so strengthen their operations.

To teach men to fly is a difficult task. Also, the growth of aviation has been so rapid and the pressure of problems of all kinds so continuously on the executive, that no one has yet been able to give pilots instruction beyond the imperative technical necessities. Such has been the concentration on these, the procedure and practice of flying — on instrument work, navigation, meteorology, engines and aircraft, rules and regulations, and airmanship; so much procedure and technique has been laid down for situation after situation that it is easy to forget there is another and important dimension to the profession.

The 'Know-How'

In this business, technique (broadly defined as "know-how") is absolutely vital. Life in the air depends on it. But if it is not combined with a basic philosophy which will permit its wise, judicious application, the pilot is still not very strong. Without such, a pilot must compress all his operations into the boundaries of the technology he has been taught. This is obvious—for it is all he has. Thus he will be ill-equipped to handle the many situations which occur beyond his narrow horizon, and will acquit himself badly, perhaps even dangerously. We have seen many examples of this sort of thing in our short history, so many in fact, that the basic philosophy here mentioned has, through necessity, developed spontaneously in each of us.

The purpose of this work is to catalogue as much of this philosophy as is possible. In doing so it offers a sort of standard against which practicing pilots may measure their own technique, and which pilots of the future can also use. It will try to explain a pilot's place in the world, his ethics, responsibilities in detail, and his business relations. It will point out some of the problems which face pilots and it

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will emphasize the value of judgment. Finally it will discuss the differences of various kinds of flying and explain the possibilities of a career in the air.

The Profession

As suggested in the introduction, the aviation industry has grown at a fantastic, unparalleled pace. Born at Kitty Hawk in 1903, it stands today, just fifty-two years later, an industrial giant of immense proportions. The air line industry in these few years has grown from nothing to a major, world-wide transport medium, which carries millions of passengers and thousands of tons of goods every year. Nothing can develop as fast as this without growing pains. All air lines have had them, and will no doubt continue to have them until such time as development steadies, or at least proceeds at a slower pace. Problems, bottlenecks, and organizational struggles continue. The people, who make the air lines, are not yet static in their relative positions with each other, but ebb and flow in importance in keeping with their departments.

The position of the pilot in the organization is unique in that he is, and will remain, as important to the air line as are the aircraft it operates. But whether his place as the operator of the essential machinery ensures him high prestige within the organization or not is another matter, and one which has had considerable review.

First A Hero

In the beginning a pilot was a hero, a brave, if foolhardy, man who willingly risked his neck aloft in structures hardly more substantial than a child's kite. Then engineering got under way and produced yearly improving aircraft of great strength, substantial weight, terrific range, and wonderful reliability. Navigational aids, which were highly reliable and relatively simple by which to fly were developed, communications became excellent, and automatic black boxes were built, which did everything but write up the log book. In the face of all this technological advance the attitude towards pilots of non-flying airline employees, of management, and even of pilots, began to change. The feeling grew that this was an engineer's business and that the ultimate fate of the pilot was to be an engineer's operator—a technician—a highly skilled tradesman. The respect for his bravery lessened with the rapidly decreasing accident rate, and a certain resentment was evidenced over the high pay and privileges he enjoyed. Pilotage seemed surely doomed to decreasing importance in the total picture.

Mechanics Fail

But then engineering and science came suddenly against barriers to their domination. It was found that all things mechanical, however well designed and built, sometimes fail, that mechanics are not immune to mistakes, and that the great complexities of modern aircraft pose difficult problems in operations. Meteorology, it was discovered, is not an exact science, the air being a vast ocean, which nature operates without any regard for the desires of man, and in a most capricious manner. The pilot's stock began to rise. It had to, because it developed that he was the only one who could assess and decide on the constantly occurring problems encountered in flight. Soon the pilot became Captain to most people and the word "professional" was increasingly applied to the pilot's occupation. Some still defer the granting of such honor, and there are even some practicing pilots who hesitate to count themselves professional—but this is not the majority thought.

The Future

What of the future? Is the current rise in prestige of pilots a mere swing of the pendulum in a growing business, or has the pilot's occupation found its final place in the air line picture? Will science once again depress the stock of air crew? The answer will be found in the elements of the occupation, in the type of energy it requires, and in the caliber of men it needs. Perhaps it would be wise to examine the vocation to see whether pilotage should be accorded professional status. To overrate oneself is foolish conceit. To underrate oneself is false humility, and damaging to the soul.

What, then, is a profession? There are some, who define it as an occupation which is learned at an established university where a degree is awarded to those who have qualified. This idea limits the professional field to such college-learned skills as medicine, law, applied science, the arts, etc. The dictionary is broader and vaguer, terming it an occupation one professes to know, and differing from a trade, which is specifically an occupation requiring skill of the hand and body. Further, the university definition rather confines the professions to occupations, which can be classroom taught, ruling out the skills of new businesses and those which must be learned in the field. An excellent example of the latter is that of the marine navigator, an accredited profession since history began, and one which, beyond its first principles, can never be learned in school.

It seems more sensible to conclude that a profession is an occupation which has so many intangible facets to it, that success requires the constant use of thought, judgment and discrimination. This differs substantially from a trade where the skill is predominantly of the hand and body, each operation being performed the same way. Thus a carpenter, building a house, does not have to consider the effect of the subsoil on the studs, or vary his cabinet making to allow for Coriolis force. Studs and cabinets go in according to plan, sixteen-inch centers wherever you build nowadays. Such con-

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Certification Of Turbo-Props

The Essential Differences In Turbo-Prop And Reciprocating Engines Give Rise To Allied Certification And Operating Problems, The Author Reports

By Raymond B. Maloy

Chief, Flight Test Branch, U. S. Dept. of Commerce

Regulatory and certification problems associated with the turbopropeller transport airplane, with particular emphasis on performance and flight characteristics, are not an entirely new subject to us at CAA. As long ago as 1948, our technicians were assigned the task of familiarizing themselves in detail with the turbopropeller power plant and the problems, which could be expected to evolve from the installation of this type of engine in an airplane.

Since that time we have had the experience of examining in detail, either from a certification or familiarization standpoint, a number of different turbopropeller designs. The nature of aviation development and economics the world over was such that the first turbine transport actually presented to CAA for airworthiness approval was a turbopropeller model built by Vickers-Armstrongs of England, the Viscount. Later on in this article, I will report on how its certification was accomplished.

Essential Differences

But first let me review some of the essential differences, from both a certification and operating viewpoint, between a turbopropeller and reciprocating engined airplane, in which I believe you will be most interested as pilots.

The fundamental differences can be summed up in the greater speed/height operating regime and the different thrust and drag characteristics of the power plant. These differences give rise to associated problems in other areas, such as cabin pressurization, power plant controls, etc.; and of course many of these problems must be met by the formulation of appropriate policies governing their airworthiness aspects.

Two Turboprop Variants

There are two basic turboprop variants: the single shaft engine, where the compressor, turbine and propeller are all mechanically linked together; and the free turbine engine where a high pressure turbine drives the compressor and a low pressure turbine drives the propeller. Both these models are presently available in axial and centrifugal compressor form. The Viscount, for example, uses a Rolls Royce Dart centrifugal single shaft engine; the Brittania, a Bristol Proteus axial free turbine; and plans for the Lockheed 1449 call for a Pratt and Whitney T34 axial single shaft engine. From a regulatory point of view we are particularly concerned with the high drags which can result from engine or propeller malfunction.

On The Cover

Major domestic air carriers have placed orders for the turboprop Electra air liner now readied for production at Lockheed Aircraft Corp. According to the manufacturer, it will be designed for cruising at 410 m.p.h and a top speed exceeding 450 m.p.h., will measure 104 feet, 2 inches in length and will have a wingspan of 99 feet. Its tail tip will be 32 feet, 3 inches from the ground. Gross take-off weight will be 110,000 pounds and maximum landing weight 93,400 pounds, Lockheed officials announced.

The high drags from malfunctions arise because of the high powers required to turn the compressors, the limited rpm operating range of most turbine engines, and the attempt by the governor to keep the engine turning at the selected rpm. Since a propeller is very inefficient as a windmill, extremely large drag loads can result, and can be experienced very suddenly. These conceivably could cause loss of control or failure of the airplane structure unless some means of preventing peak load development are employed. The solution universally adopted involves the application of one form or another of automatic feathering, backed up in some cases by propeller decoupling.

Here are some of the critical types of failures that must be considered in certificating the turboprop transport:

▶ On the axial free turboprop a propeller reduction gear failure appears to be the most critical case since it permits sudden unloading and subsequent overspeeding of the turbine. This could lead to destruction of the turbine disk.

▶ On the axial single shaft turboprop the failure of the turbine wheel or shaft could be the most critical situation design-wise, because it eliminates the driving source of the compressor and the propeller. Following the failure, the large compressor drag is suddenly thrown on the propeller, which tends to flatten pitch (and thus increase drag) in order to cope with the load. Automatic feathering (or its equivalent) thus appears to be a mandatory item.

▶ The centrifugal single shaft turboprop in its present form does not appear to have failure characteristics as spectacular as the axial series because the compressor operates at a lower power and compression ratio. The possibility of turbine failure or propeller reduction gear failure still makes auto-feathering necessary for take-off.

Thrust Characteristics

The manner in which the thrust characteristics of a turboprop differ from the reciprocating engine is more well known. Its greater temperature sensitivity can be compensated for by appropriate temperature accountability rules and/or the use of water methanol on hot days.

As for the other significant difference between piston and turbine engined airplanes, that of the greater speed/height regime, the turboprop lies somewhere between the latest piston-engined types and the initial series of jet transports. Its technical advance toward higher speeds and heights is in the nature of evolution rather than revolution and should not prove especially difficult from the certification standpoint.

Methods Of Turboprop Certification

As for the actual handling of a turboprop certification, let me cite the case of the Vickers Viscount, which was originally certificated in the

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Approach Light Use

An Analysis Of Sure Criteria For Safety In Instrument Approaches

Constellation coming in for landing at Newark Airport over Sylvania Strobeacon centerline approach lighting system.

By Capt. E. A. Cutrell
American Airlines

With the variety of approach lights installed throughout the United States and the world, the air line pilot has one criterion for a safety gauge in making an instrument approach regardless of the type of approach lights available. On each instrument approach there is a safe critical altitude below which there is an element of hazard if transition to visual guidance has not been attained.

For example, many pilots have a greater tranquility of spirit with a critical altitude of 200 feet on Runway 4 at Newark Airport than one of 400 feet on Runway 13R at Chicago.

Four Factors Cited

The determination of this critical altitude is the responsibility of each of us on every instrument approach we make. There are four principal factors to be considered on every instrument approach even before the approach is started in determining this minimum safe critical altitude:

- The type and effectiveness of the approach lights available as well as threshold definition and runway markings. Also, the state of overhead brightness or darkness in the approach zone and on the runway. There are certain brightness conditions, particularly when approaching into the sun with a low level ground fog, when the highest intensity lights are scarcely visible right down on top of them.
- Type of aircraft, its gross weight and maneuverability, particularly as regards those flying characteristics, which affect a pull-out and go-around, as well as the state of fatigue of the crew.
- The obstructions in the approach zone and in the pull-out area beyond the runway.
- The particular type of weather; cross wind, tail-wind, turbulence and precipitation with attendant windshield visibility.

Thus there can easily be decided differences in the safe critical altitude on every instrument approach we make, and it is not in the manual.

It is important to weigh as many of the above four factors before the approach is started, in order that a

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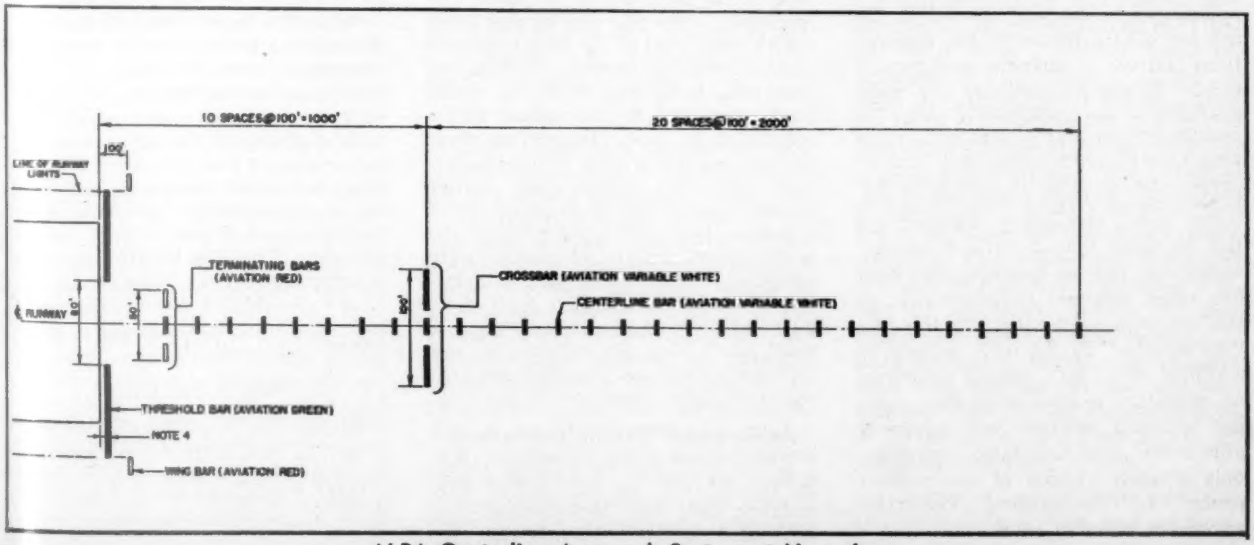


ALPA Centerline Approach System at Newark.

Weather And Today's Operations

In Modern Operations, Weather Is Responsible For Only A Small, And Still Shrinking Percentage Of Uncompleted Scheduled Flights. The Conclusion: All-Weather Flight Is Nearing Reality

By David S. Little

Supt., Airways Aids and Electronics, American Airlines

"All-Weather" is a very loose or broad term. Whether we in air carrier operations may sometime in the future be able to completely disregard the existing weather situation remains to be seen.

Aeronautical engineering, manufacturing and operational experience have for all practical purposes already eliminated or reduced to an inconsequential factor the in-flight icing problems, which proved so costly in the past. The efficiency of thermal airfoil, electric propeller and windshield de-icing methods employed on our latest air transports is so high that today few of us give much thought to the possible in-flight aspects of ice accumulation. Of course, ice and snow on the runways, taxiways and ramps of our terminals provide us just about as much trouble and exposure as ever. Much remains to be done in this area.

Thunderstorm Hazard On Way Out

The other most accepted delay or hazard factor to flight—thunderstorms, appears to be meeting its end in the not too distant future by the applications and use of airborne and ground radar. So much knowledge is already available on the usefulness of radar for circumnavigation of thunderstorms and turbulent heavy precipitation areas—particularly through proper use of airborne radar specifically designed for this purpose that I believe we are seasonable safe in assuming the next five years will see thunderstorms go the way of in-flight icing. But to apply "All-Weather" in the more general or accepted sense let's assume we mean an operation so conducted that existing terminal weather will adversely affect the safe scheduled operation only a small fraction of one percent of the total time involved. The latter appears achievable in the foreseeable future—but at a price. Whether this cost can be justified has been much argued. Let's look at a few of these arguments.

In the case of one large operator, who operated to legal basic minimums of only 300-¾, records indicate these minimums permitted this carrier to complete 98.14% of all scheduled flights during 1954.

Small Percentage

The percent of uncompleted scheduled flights was obviously small—only 1.86%. In looking carefully at this 1.86% factor of uncompleted scheduled flights we find this represents 584,495 miles cancelled for purely mechanical conditions. However, the miles cancelled for purely weather reasons represents 1,208,020 — slightly more than twice the miles were lost for weather reasons than were lost for mechanical factors. In the case of this particular operator this amounts to $1,059,026 lost for mechanical and $2,341,761 lost for weather reasons.

To go a little further, if we drop out the percentage of uncompleted scheduled flights attributable to purely the mechanical, we find this carrier using only a small part of the long requested total terminal all-weather facilities and only basic minimums of 300-¾ would have completed 99.39% of all flights scheduled in 1954. Remember these factual figures are those of a large carrier. In other words, this carrier charged up only 0.61% of uncompleted schedules to weather. As some of the uncompleted flights obviously were cancelled because of enroute thunderstorm conditions or lack of legal alternates within economic or fuel range we must admit that, percentage-wise, our terminal all-weather consideration represents a rather small part of the total.

Achievement Despite Limitations

Let us recall that these figures reflect in general the use of, during IFR weather, only one implemented runway—and all too frequently that this one runway is not adequately implemented for all-weather flight. To the best of my personal knowledge we have only one runway in the United States implemented as requested by ALPA for all-weather flight — Runway 4 of Newark, N. J. So, the mentioned operational reliability has been achieved with less than desired aids and with single runways.

It is my recollection that ALPA has previously indicated that for the maximum weather operation the following is desired:

- Two long hard surfaced runways oriented approximately 90° to each other and aligned so far as practicable to provide landing areas, useful under the specific field low visibility versus wind velocity situation, with minimum tail or crosswind components.
- Two ILS each complete with LMM-LOM components on both front and back courses.
- Four configuration A approach light systems, each complete with condenser discharge lighting.
- Both runways high intensity lighted and with surface paint markings.

While few major terminals have such a favorable location as to permit instrument approaches on a 50 to 1 clear path basis to four runways—and new airport cost is astronomical, let's assume our airport already provides the two runways and we need only the afore-mentioned electronic and lighting implementation. Let's assume further that our airport already has one complete ILS, GCA and Configuration A approach lights. Then, while such costs vary widely we are talking about an expenditure in the order of $385,000.00 per terminal.

Worth The Cost

Recall the very small percentage of incompleted scheduled flights effected by weather—0.61%. Is such a percentage worth such cost? I personally think so—possibly economically unjustifiable today but quite certainly so tomorrow.

The mentioned "percentage of completed schedules" figures as normally accounted for by most air carriers does not reflect the percentage of schedules completed on time. Many of the reported completed schedules, while completed, are completed very late. Frequently late because of awaiting terminal weather improvement. Others are completed but at alternate airports. You, I and John Q. Public wish to complete schedules on time or relatively so and equally important wish to wind up at our scheduled rather than an alternate airport. Public acceptance of safe, on time, regardless of weather, operation will most certainly be very favorable although in dollars and cents far too intangible for me to either measure or estimate. But there are other more immediate economic effects.

Aircraft Capital Cost

As we all well know the capital cost per aircraft unit has a very significant effect on how closely management watch their aircraft utilization figures. Most of us can easily recall when our managements thought little of our requesting a DC-2 or DC-3 for pilot training, looking over a new route, looking at some new accessory equipment development or even route qualification establishment. And we all well know how difficult it is today to find a DC-6 or 7 or 1049 for just the legally required pilot proficiency checks. New routes we look at otherwise. If a manufacturer of a new gadget doesn't show up with his own aircraft to demonstrate his new product it usually doesn't get looked at. Route qualification we do on schedule or else. Aircraft utilization costs are very large and economically important today.

Digressing just a little—but to point up the importance of aircraft utilization a little more, I have felt that manufacturers of automatic pilot equipment have long missed the boat saleswise by trying to sell their product on the basis that with automatic approach couplers it could make a better ILS than a pilot.

I was glad recently to see one such manufacturer and one large airline look into how much straighter the autopilot could wheel than would a pilot and how much better the autopilot could keep her on the step at maximum speed than would the average pilot. While this survey was in my opinion all too meager to bring out all of the pertinent and true facts, these two outfits came up with this statement:

"The annual savings in dollars, using direct operating costs only, is $250,000 by using the automatic pilot on a fleet of 25 DC-7's."

This survey concerned only the enroute level of flight savings. Details show this money is salvageable by saving only 6.20 minutes of time in an 8 hr. 30 minute non-stop flight—percentage wise, only 1.25 per cent of the flight time. Seconds saved in the operation of modern transports very rapidly build up staggering numbers of dollars.

Scheduling Of Aircraft Maintenance

The economics of current air carrier competition have made scheduling of aircraft maintenance a very large factor of total operations costs. Large carriers find it most economical to so schedule and route their aircraft that one legally required maintenance check is accomplished here, the next at some other terminal on their system, a third at possibly another terminal and the major progressive overhaul check at still another. Scheduling and routing of fleet aircraft so that each winds up where desired within the legal time limits and with no unused legal time to spare, represents millions of dollars to our industry. These dollars could be applied to the net profit side of the ledger.

Our so-called All-Weather implementation of terminals and aircraft is directly related to these economics of aircraft utilization. A ship losing a minute here, five minutes there, from the effects of terminal weather on a single scheduled operation very quickly throws the airline maintenance scheduling into a cocked hat and at usually uncalculated or at least, undiscussed cost.

Would Cover Costs

While actual cost figures are very difficult to accumulate (these certainly are not readily available), from what I have found, it is my humble opinion that safe, reliable, on-time scheduled operations (on-time because of terminal all-weather flight facilities), would go a long ways toward payment of the aforementioned terminal costs. Whether the mentioned potential of increased public acceptance of scheduled air transportation plus this potential economy of aircraft operational costs may fully (profitably) justify these terminal costs is something I believe our several crystal ball departments could well be devoting more time to much more profitably than on some of their predications.

The aforementioned need for certain electronic and visual aids implementation of the terminal does not by any imagination cover the total gamut of needs to make all-weather flight safe and economical. Let us not forget some of these other little discussed factors:

- The need for sufficient, effective, high speed runway turn-offs.
- The need for airport terminal gate space to effectively utilize the maximum capacity of all-weather runways. Remember those runways are fantastically costly and we can't get two when maybe one could suffice.
- The need for greatly improved means of guiding the aircraft at reasonable taxi speeds from the runway to gate and vice versa in visibilities so low that ground traffic normally finds it very hazardous to move through such weather.
- The need for clean, smooth, dry runways or perhaps we should say optimum coefficients of runway friction. Reverse props or reverse jet thrust does not provide Joe, the pilot, much tranquility of spirit when runways are ice covered, or even just wet. Joe's "twitch factor" is very directly related to available runway friction.
- The need for greatly improved windshield cleaning, particularly in the moderate to heavy rain condition. Late military jet fighters have very effective windshield cleaning by bleeding hot compressed air across the outside of the windshield.
- The need for aircraft flight instrumentation, which will permit the Captain of a 4 to 5 million dollar jet transport to really become master instead of wheelsman of his expensive craft. An autopilot auto-approach equipment cannot do any better on an ILS than the average airline pilot—in fact it can't do as well. The pilot knows the bends and bumps in localizer and glide slope, disregards them and provides the customers a smoother ride. But this equippage provides the pilot that always essential "time to think"—to be the master instead of the wheelsman. And, last but not least let's provide our pilot zeroing instrumentation—the same intelligence we supply the autopilot with which to work.

All-weather flight is possible and can be accomplished safely and economically—given a little encouragement and development time.

The Economics Of Air Safety

Safety, Says The Author, Is An Essential Element Of Good Business And Its Cost Is More Easily Sustained Than The Price Paid For Lack Of It

By Carl M. Christenson
Director of Safety, UAL

It is fortunate that the social concern for human life and the economic concern for the protection of both life and property are such that when either one is provided for, the other is simultaneously and automatically cared for. Regardless of the motives involved therefor, whether they be humanitarian, economic, or blends and variations of each, consideration for the safety of operation is an essential element of good business and its cost is more easily sustained than the price paid for the lack of it. Accepting this precept as fundamental, good business practice dictates a policy whereby safety must be given top management approval, sanction, and support.

The Past 50 Years

The aviation industry is but fifty years of age, and in those fifty years we have progressed quite rapidly. As technical progress has been made by the engineer and scientist, the business mind has found ways and means of utilizing that progress in furthering the development of the air transport industry. And with each technical development, we have found new problems and experiences which have imposed great demands upon moral and economic considerations. It is evident, from the acceptance of the airplane as a means of travel by the traveling public, that the decisions which have been made in the past have resulted in timely progress. On occasion, the costs of that progress in terms of time, lives, and money have been great but have proven through the years to be within tolerable economic limits.

Within the last twenty-five years the scheduled air transport industry has become a full-fledged component of world-wide enterprise. During this period the technical limitations of the airplane have disappeared before the ingenuity of men determined to overcome those limitations. Likewise the limitations of operating know-how are gradually retreating before experience, science, and engineering.

With each of these limitations, the principal factor of concern has been the consideration of safety and economic liability. This concern has developed a very profound interest on the part of management in the problems related to safety. This economic interest springs primarily from three basic factors: (1) the creation of confidence in the minds of the traveling public; (2) increasing efficiency in production and dependability in flight operations; and (3) the decrease in cost of operation.

High Safety Level

Within the past five years the scheduled air transport industry has reached a comparable level of safety with surface carriers. It is important to realize that this is an acceptable level of safety as far as the general public is concerned but will continue to be acceptable only if consistent. Indeed, we have learned and are presently experiencing the fact that sporadic outbreaks of serious accidents either in operations in the air or on the ground become a serious and disturbing element within our business.

The aviation industry has just begun to tap the vast travel market which it has created with the introduction of speed, dependability, and flexibility into flight operations. The point-to-point costs of scheduled air transportation today is competitive with costs of equal surface transportation. Even so, many people still will not fly because flying to them is "strictly for the birds." Complete acceptance of air travel by the general public will come only through confidence. It will grow with each generation but will remain for many years a perishable attitude until all people become completely air minded.

Meanwhile, the entire aviation industry has a job to do because the attitude of the general public toward air travel is affected by the experiences of all segments of the industry. Headlines seldom are specific in their identity and thus create impressions which involve everyone associated with the news imparted by the headline. Thus, safety in aviation is a general problem for all to be concerned about and not specifically for one segment alone.

It is wise periodically to review our industry in the light of experience, obligation, and progress. This practice, in effect, guarantees the maintenance of the high standards of service which the scheduled air transport industry has developed within these past years.

Economic Problems

In reviewing economic problems associated with safety in general, it is possible to identify economic facts which can be utilized to define the magnitude of the problem and, particularly, indicate the amounts of money, time, and effort which can be budgeted to eliminate the waste of manpower and materials in our operations. The determination of such costs is largely dependent upon the accuracy and completeness of records pertaining to the problem. Thus the first step each company must take is the development of an adequate system of records, incident reporting, and the development of formulae for determining the true costs of the experience. It is likewise important that a trained staff be utilized in the compilation and analysis of those reports.

At this time it is possible to provide only preliminary estimates, however, these estimates compare favorably with data from other industry. It is not the intent here to define the economic problem of safety of any individual company nor do the figures presented represent such experience. They are presented on the basis of average expectancy of an operating company in the light of existing statistical facts obtained from the National Safety Council, Civil Aeronautics Board, and the Air Transport Association as well as individual company records.

The Equipment Damage Problem

In this area the problem of determining costs is a difficult one; however, ingenuity will provide a method of using standard operating statistics to determine the costs. Again, the real

problem is that of complete and accurate reports concerning each incident. In this area, it is entirely possible grossly to underestimate the seriousness of the problem through failure to determine what happens to the airline when a ground accident occurs. The history typical of a minor accident, as referred to, is something like this:

Incident Described

An inbound aircraft taxiing in struck the tail cone of another aircraft with its wing tip. Immediately both aircraft were out of service, delays occurred, passengers were inconvenienced, and no other equipment was available. Outbound trips and through trips were cancelled. The passengers had to get where they were going and ended up in the competitor's aircraft or, after further delay, on other trips of the company. And during this delay those passengers had to be lodged in hotels at company expense along with the necessary embellishments to quiet justifiably irate passengers. Both aircraft were out of service for approximately ten productive hours and spare equipment was utilized to fulfill schedule requirements but, where impossible, substitutions and cancellations were required.

Usually the report on such an incident states that damage to the aircraft required $50 worth of aluminum and rivets for one and $12 for the other; 12 man-hours for repair on the one and 3½ hours for the other. The total costs $81.80 for the first airplane and $11.25 for the second aircraft. However, through complete analysis, two trips were cancelled, sixty passengers inconvenienced; all were accommodated on later departures, consolidations, or on other airlines, thus resulting in loss of revenue. Equipment substitutions were required to cover other schedules affecting the line operation for the next twenty-four hours and involving three equipment substitutions and two cancellations from the other end on account of equipment balancing. Thus, by the time we consider the true costs of such a small incident, instead of being justifiable operating expense it logically must be considered as unjustified business expense and therefore subject to elimination through good business judgment and operating practice. The difficulty to define the magnitude of the overall safety problem, if accurate accounting is not made for each and every incident, is quite evident.

A method of determining these costs is being used at present as a sampling device, the basis for which is the use of existing information in the modern operating statistical section of the operations organization. The method requires that with each exposure the administration study the accident, report the facts, and determine the costs from the standpoint of its administrative interest. This divides the work, provides more complete information, and a check list for the administration as an aid in developing true cost analysis. A brief diagramatic chart of the method appears below.

This may appear like a lot of detail for a minor ground incident but the costs of such incidents, as determined by this method, are beginning to develop their true proportions in relation to operating costs. Of course, the real importance of such incidents to management is the economic concern for the destruction of dependability, which in some cases will infest the entire system following the incident. The insidious part about such incidents is that management receives little sympathy from the inconvenienced passenger and so tends to destroy acceptance of the service rendered by the operator.

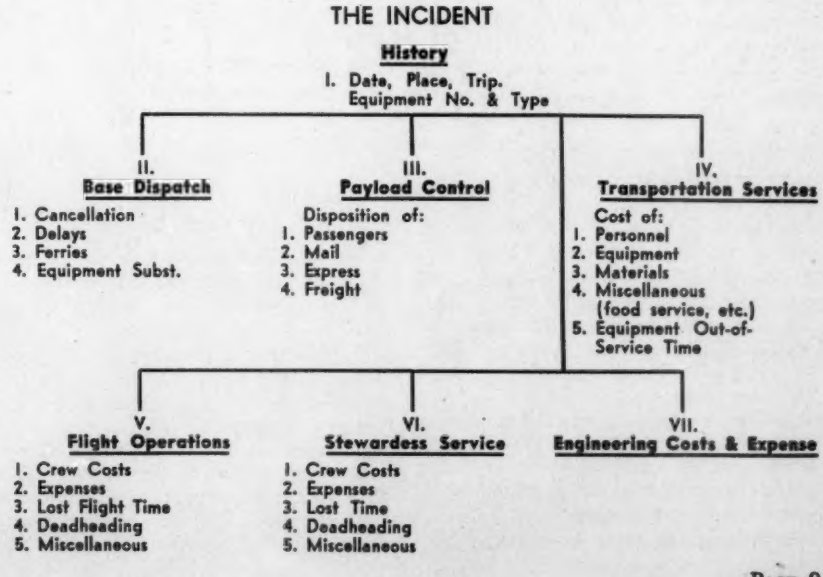
The combined yearly costs of all ground equipment accidents; accidents involving ground equipment and aircraft; and ground accidents involving one or more aircraft, for an organization involving 300,000 operations a year, are estimated at between $600,000 and $900,000, depending on the efficiency of the total operation. Taxi accidents between aircraft by both flight crews and ground personnel have been notable contributors to this high overall cost. This safety problem is becoming more and more pronounced at highly congested airports where gate space is at a premium. The solution lies in straightforward production engineering of the ramp areas.

Miscellaneous Handling Damage

This is an insidious type of equipment damage which is costly to the airlines and a factor which comes under the heading of "tolerated" abuse. Such equipment damage includes the puncturing of holes in the tops of wings caused by dropping of fuel nozzles, puncturing of the fuselages by fork lifts, pallets, carts, etc., damage to wing fillets by loading stands, and all the many other types of equipment damage incurred in service which places an added burden on engineering and maintenance. The puncturing of a fuel tank means pulling the equipment out of service for repair. All these things are expensive to the aviation industry. A one-year survey of this problem revealed the following:

Added Engineering Costs...	$ 50,000
Added Rework Costs.....	40,000
Total Out-of-Service Cost.. (100% allocation)	1,000,000
	$1,090,000

(Continued on Page 15)



The ALP
CAMER

UAL Negotiating Committee

Conference at Home Office with ALPA'S L. Koch during recent contract negotiations.

L1649A Evaluation

ALPA New Airplane Evaluation Procedures and technical conferences were held during mid-October when ALPA representatives conferred with Lockheed officials on new L1649A. Shown with model are l. to r. TWA Capt. R. F. Adickes, Chairman, ALPA 1649A Evaluation Committee, and T. G. Linnert, ALPA Engineering and Air Safety Department; Art Flock, Lockheed's Chief Project Engineer (standing); R. Stocksdale, Flight Test Engineer; A. Smith, Assistant Chief Project Engineer. The plane essentially designed for long-range overseas operations, embodies numerous refinements over previous Constellation models. Flight demonstration is scheduled for late 1956.

Capital MEC

S. A. Colvin, Administrator, reports on Home Office operations at Capital Airlines Master Executive Council meeting in early October.

ALPA
MERA

ALPA's 25th Year

Mrs. K. McMurray, Mr. McMurray, Exec. V.-P.; Pres. C. N. Sayen, Mrs. Sayen; and Dolores Ford (foreground), former employee, at ALPA Staff Reunion, Oct. 21, feting Association's 25th anniversary.

On Home Office Visit

German labor leaders study ALPA operations. L. to r. (sitting): O. Rose, Public Services, Transport and Traffic Workers; F. A. Groomping, U. S. Dept. of Labor; J. L. Sandelman, U. S. Dept. of State; K. McMurray, Exec. V.-P.; H. Steldinger, Civil Aviation and Road Transport Workers; (standing): T. N. Bowdle, Council Coordinator; F. Schmidt, Public Services, Transport and Traffic Workers.

Performance Data Vs. Results

An Aircraft Test Pilot Compares Transport-Type Performance Data With The Results Actually Obtainable In Air Line Flying—A Safety Forum Report

By Robert P. Brush
Engineering Test Pilot, Douglas Aircraft Co.

We, at Douglas, feel that it is extremely important to work as closely as possible with the personnel, who are actually operating our equipment. Through our contacts with the airline management and the pilot personnel, we obtain working knowledge of your problems, and because of this, we are continuously able to improve our aircraft. We also feel that, in turn, we can pass on information and procedures to you that will assist in obtaining even safer and more efficient operation.

In response to a request by ALPA engineers to compare transport-type performance data with the results actually obtainable in line flying, we will divide the subject into three parts:

- First, two required CAA tests will be briefly described, and other government and Douglas Company tests will be mentioned;
- Next, margins existing between published data and actual performance will be pointed out.
- Since training requirements are closely allied with the subject, the last part of this article will include a review of training as it applies to the air line pilot.

CAA Testing

When we talk about CAA testing, it should be borne in mind that the testing conditions set forth by regulations provide us with a base line or a reference point around which the aircraft may be evaluated performance-wise. Without a standard to go by, it would be impossible to satisfactorily resolve the manufacturer's test data, or ever to publish information useful to the operators.

Now, specifically, how do we get the numbers? Take, for example, the CAA demonstration for determining the landing distance over a fifty-foot obstacle. The runway used for these demonstrations is hard-surfaced and dry, which is permitted by the regulations. The landing speeds over a fifty-foot obstacle are controlled at not less than 1.3 times the stalling speed. A minimum of five landings is used to determine the average landing distance. In these tests, it must clearly be demonstrated that no damage has been done to any of the tires or brakes. In addition, each landing must be acceptable, as witnessed by the CAA.

When the CAA minimum take-off runway length is determined, it is done by matching the distances required for two possible conditions: First, accelerating up to V_1 speed with four engines operating, then cutting power and stopping with minimum use of the brakes only; second, determining the distance required to accelerate up to V_1 speed with four engines operating, cutting the critical engine, continuing three-engine acceleration up to V_2 speed, and taking off and reaching a fifty-foot height at V_2 speed. The first condition determines the "accelerate-stop distance" and the second condition determines the "three-engine take-off distance."

Separate Tests Required

The data required to obtain all this comes from separate tests; however, at least one complete accelerate-stop run is accomplished to ascertain that the published data are realistic. Four and three-engine acceleration on the ground is accurately measured, the stopping distance is then determined and the climb rate is carefully measured in the first and second segment configurations. These tests are not run under any special temperature, humidity or atmospheric condition, and since in our case they are often conducted at desert bases, many of them are run on very hot days. They are then corrected to standard conditions. In order to minimize correction, we usually attempt to conduct the engine calibration when at least 80% humidity conditions prevail; if humidity is greater than 80%, it is not re-corrected.

Gross-Weight Evaluation

The airplane is also evaluated at gross weights in excess of the certified operating weight. Four, three, and two-engine enroute and landing climbs are run at various altitudes and weights to adequately cover the normal operating range and make excessive extrapolation of the data unnecessary.

In addition to this test work, many flight hours are spent in conducting tests on long and short period dynamic stability, maneuverability, controllability, dives where maximum airspeed and mach number must be combined, engine cooling, accessories and equipment, stalls and performance. On the DC-6B, over 850 stalls were made, most of them with power on.

Speed and range are very carefully checked to establish compliance of our guaranteed performance figures with the actual results.

Airport And Route Analyses

As mentioned previously, the test figures serve only to provide a base line for future use in the Flight Manual. In order to apply these data to actual air carrier operations, many hours are spent in airport and route analyses. In these analyses there are numerous considerations that have to be taken into account that are not found in the CAA Flight Manual. Some of these considerations are as follows:

- The maximum take-off weight may be limited by obstacles within 200 ft. on either side of the runway or 300 ft. on either side past the end of the runway boundary where a maximum bank angle of 15 degrees is permitted after a height of 50 ft. is reached to avoid obstacles within the flight path.
- The runway gradient as well as temperature accountability may restrict the take-off weight and this means that computations must be made for gradient effect for each runway that may possibly be used on each airport where operations are contemplated.
- The enroute terrain clearance problem requires the following considerations on a four-engine airplane:

1. With four engines operating at maximum continuous power, the airplane must be able to climb at least $6_{V_{50}}$ (in feet/minute) at a point 1,000 ft. above the highest ground or obstruction within 10 miles on either side of the flight path.

2. With three engines operating at maximum continuous power and the

propeller of the fourth engine feathered, the airplane must have a rate of climb of $.04_{V_{SO}}2$ at 1,000 ft. above the highest ground or obstacle within 10 miles on either side of the flight path.

3. With two engines operating at maximum continuous power on one side and the propellers of the other two engines feathered, the airplane must have a rate of climb of $.01_{V_{SO}}2$ at 1,000 ft. above the highest ground or obstacle within 10 miles on either side of the flight path or at 5,000 ft. whichever is higher. Fuel dumping may be used to meet this requirement, but enough fuel must remain to reach a point 1,000 ft. above a suitable landing area.

There are several other considerations that affect the take-off analysis and these include headwinds, tailwinds and humidity which affects engine power. The engine manufacturers permit some overboosting of the manifold pressure under high humidity conditions which will permit some recovery of the power loss.

Actual Line Service Data

Now let's look at some of the "cushions" that exist between the tests we run on a controlled basis and the way the data are finally used in actual airline service. These margins make it possible for the average, but properly-trained air line pilot, to obtain certificated performance in an emergency.

First we will discuss landings:

▶ The actual landing distance over the 50 ft. obstacle obtained during tests cannot exceed 60% of the effective runway length when applied to the airports used by the airline. This provides an additional 40% runway length for safety.

▶ Seldom, if ever, is a fifty-foot obstruction located right at the approach end of an active runway; therefore, in actual practice, more runway length is available. Test rates of descent are practically the same as used by the airline on a normal ILS approach.

▶ The last item, providing a wide margin of safety for the landing condition, is reverse thrust. On our aircraft equipped with reversing propellers, no advantage has ever been taken of this significant decelerating device to reduce the field lengths.

Built-In Margins

Next, we will cover some of the "built-in" margins we have after the optimum performance data for the take-off field lengths are assembled.

▶ In the first segment of the take-off climb, it is assumed that the gear is fully extended until it is completely retracted. The DC-6 gear, for example, has 38.6 sq. ft. of equivalent flat plate area, which is ten sq. ft. more than the basic aircraft.

▶ No ground effect is included in any of the take-off climbs. Below fifty to seventy-five feet, aerodynamic interaction between the aircraft and the ground will improve rate of climb.

▶ A complete power failure of the critical engine is always assumed. Actually, experience shows that normally the loss is not instantaneous, complete, nor always limited to No. 1 engine.

▶ A time delay is required at V_1 speed before brakes may be applied or throttles closed prior to starting deceleration. This time delay is equivalent to a distance of 220 feet for the DC-7.

▶ Again, as for landing, no advantage is taken of reverse thrust on the remaining three engines.

▶ Fortunately, few airports have fifty-foot obstructions exactly at the end of the runway.

▶ The engine is approved for five minutes at take-off power. Present regulations do not call for its use for more than two minutes; if a real emergency exists, this period may be extended.

▶ One of the greatest gains in actual performance, as compared to certified performance, comes from the simple fact that the possibility of an engine failing exactly at V_1 is extremely remote. To the best of our knowledge, a complete engine failure on a four-engine aircraft has never occurred exactly at this point. If the engine on your 100,000 pound DC-6 fails ten knots below V_1, it requires 1,000 feet less distance to stop the aircraft. Conversely, if the engine fails ten knots above V_1, the theoretical fifty-foot obstacle will be cleared, using 400 feet less runway.

Regardless of the percentage each item adds to the test values, we know that every time a line pilot flying line equipment has checked actual performance, "book" values have always been equaled, and have usually been bettered. We, like yourselves, are very content to keep it that way.

Training Aspects

Now turning to training aspects: When we think and talk training, everyone should realize that it is as important a subject as the review of our CAA Requirements and their application to airline operation. From time to time, the regulations are discussed and questioned as to their adequacy from the safety standpoint. This is as it should be. Perhaps not often enough, though, do the operators or the pilots themselves realize how much safety can be added to each flight by a completely-trained crew operating in the cockpit as a team.

Like reviews of regulations in the interest of safety, so must the captain's training and knowledge come into focus. It is felt that if a captain is to be truly in charge of an aircraft, he must be completely familiar with his aircraft —system-wise and performance-wise. He must know exactly what duties his crew members will perform for him, normally and in an emergency. Furthermore, he must know as much about their respective jobs as they do. This is necessary in order that the crew members be properly directed for all phases of operation.

Continued training provides the only means whereby the captain and his crew can be kept up-to-date on the safest and most efficient way to operate the particular type of equipment they have bid to fly.

Basic Fundamentals

Perhaps even more fundamental than this, our experience in working with the airlines indicates that many pilots have really never been taught basic airplane and engine fundamentals, or if they have, they have forgotten them. It is for this reason that we have recently published a flight study guide, primarily written around the DC-6A/B.

This guide describes, in pilot's language, general aerodynamic characteristics, structural design limits, flight performance and operating techniques. Ample use is made of graphs and illustrations.

It has been demonstrated that a working knowledge of these subjects will result in improved safety and reduced operating cost. Improved safety is obtained by a complete understanding of the airplane performance capabilities and limitations. Reduced operating costs are the result of flying the airplane in the most efficient manner possible.

Outline Provided

It is not our purpose here to pinpoint responsibility for the presence of some crews in airline transport cockpits, who would be greatly benefitted by more training, nor is it our purpose to determine what group will raise the "know-how" level for the entire profession. Assuming that the need for more thorough crew training is now being recognized, the following is submitted for your consideration:

▸ Classroom instruction on aircraft system, accessories and engines. The course must include proper use of the systems for both normal and emergency operation.

▸ Classroom instruction covering the general aerodynamic characteristics of the aircraft, structural design limits, flight performance, and operating techniques. These courses require a well-qualified instructor and the use of view-graph-type illustrations to put over the subjects by making the course interesting.

▸ Longer periods set aside for cockpit drill in an aircraft on the ground will materially aid in familiarization prior to actual flight training. With the "classroom" on the ground, and without the distractions of actual operation, more information can be assimilated and retained.

▸ Often in the past, transition flight training has been of insufficient duration. Furthermore, it is usually so concentrated that many valuable points cannot be retained. It is recommended that sufficient transition time be allotted to accomplish required performance demonstrations. These must point out the aircraft's full capabilities and its limitations; in other words, what can and cannot the aircraft be expected to do. In-flight, engine-out emergencies can readily be demonstrated at the maximum landing weight as well as at the maximum take-off weight by reducing the normal maximum power to a lower value. The flight simulator is now getting additional recognition for its value in this type of training.

▸ On every periodical enroute check, an oral review should be given and include:

1. Normal and emergency operation of the aircraft systems.
2. Normal and emergency flying techniques as they apply to take-off, climb, cruise, approach and landing.

We feel certain that as much air line safety can be added by expanding crew training for all phases of flight operation, as can be achieved by modification of the present CAA regulations for some particular portion of each flight.

Air Line Pilot --- Professional Man . . .

(Continued from Page 3)

siderations, when they exist, require thought, discrimination and judgment and are professional in their nature.

Skill Needed

Air line piloting is a new skill in a new business, and is full of very precise movements of hand and body, of elaborately described techniques and rigid procedures. If this were all it entailed, it would be the work of a technician type of tradesman. However, not one of the movements of piloting, none of the technique nor the procedure can be applied without constant use of judgment and discrimination. In fact, judgment is everything in an air line pilot. Even in the normal operating maneuvers the pilot is constantly judging — in taxiing: speed, weight, wind and brakes; in take-off: wind, speed, and that delicate moment when one goes instead of stops if an engine fails; in landing: wind, angle of approach, speed, attitude of the aircraft, whether to land or go around. In the less routine parts of his work, decision is continuous and varied. In emergency, it must be fast—and right. While cruising he is constantly deciding which way to go around a cloud, or whether to slow up or keep his speed because of turbulence, or hold or change his altitude, or whether the ice is getting serious, or judging his drift for navigation. Terminal instrument work always requires thought and presents the need of several decisions, some of which are not always easy to make. Flight planning is often a problem which demands the weighing of rather unreliable evidence, and the balancing of opinions of others who don't really know either, to find a decision which will satisfy the requirements of safety and the desires of the customer. The constant solution of problems — some openly stated, some obscured in the subconscious skill of the trained pilot, some serious and important, some routine and small — are the facets of the pilot's job. To imagine a man in this business who is not constantly observing, weighing the facts as he sees them, and choosing a satisfactory path—who is, in other words, not using judgment—is to imagine a short career with a positive end. This is a profession, not a trade, and requires men of professional caliber.

The Qualifications

The qualifications of the men who fly the airliners of the world are often considered to be the medical requirements alone. This is understandable, because the medical standard is so high that most aspirants fail here, and do not get an opportunity of failing further along the way. However, while perfect health is an absolute basic requirement for the pilot candidate, it is by no means the extent of his qualifications.

Before the air lines become even slightly interested, the man wishing a pilot's job must learn to fly. This is a procedure which is well and seemingly easily taught today, but do not forget that it requires considerable intelligence and effort. The private pilot's license is only the beginning of the professional air line pilot. For he must continue his study for many years —of navigation until he is a thoroughly sound navigator, of meteorology until able on its basic theories, of aircraft and engines of increasing complexity, of many rules and regulations, of instrument flight with its exacting techniques, and, of course, airmanship for the whole of his career. He must be able to keep abreast of the developments in aviation, a business which is growing and changing very rapidly.

The Background

But health and intelligence are not enough for the air lines. Their men must possess presence of mind of high degree so they can be relied on in emergency, and be of decisive nature, willing and able to take command of the situations they encounter. They must be cautious and yet intrepid so they can accept the risks always present in the air. They must be fairly sound emotionally, able to rise above many vexations, and decidedly not accident prone. And finally, they must be adapted to, and like, the occupation. These qualifications, which do no more than define any average air line pilot, are those of a professional man.

It is not enough to be a professional man in the proper field, for professionalism goes beyond the occupation it concerns. It is also an attitude of mind, a way of thinking about things and about the profession. Professional men set their own standards and set them high. Thus doctors, lawyers, engineers and others all have their ethics and standards, which they themselves set and which all try to achieve. The piloting profession, being very young, has only recently begun to develop its ethics. To be sure, there have been traditions, not all of them noteworthy, some of them very fine, and out of these a code will be developed.

Certification Of Turbo-Props . . .

(Continued from Page 4)

United Kingdom to the current British airworthiness standards.

When American operators indicated their interest in procuring the Viscount, it was necessary under our bilateral agreement with the British to examine the basic design in order to establish the special conditions necessary to assure compliance with the general level of safety of our U. S. Civil Air Regulations. This process required ad hoc treatment of the Viscount the same as would be required of a U. S. manufactured aircraft, since our own Civil Air Regulations do not yet cover turbo-jets or turboprops in all areas. These special conditions are summarized as follows in the flight area:

- Take-off performance is made subject to full temperature accountability, and the 3-engine enroute climb is provided with a performance floor below which full temperature accountability must be applied.
- The water methanol quantity is adjusted to provide sufficient water for take-off up to the maximum take-off time rating of the engine, with an equal amount for landing contingencies, but in no instance less than five minutes per engine.
- The engine power used for scheduling performance in the flight manual is limited to the average power between engine overhauls.
- Climb stability is met with maximum continuous power rather than 75 per cent of maximum continuous power.

Future Efforts

In conclusion, let me outline the direction of CAA's efforts in the flight test area in respect to future transports. At the present time, we are conducting a detailed study of braking force coefficients in the light of a large number of variables, such as wet and icy runway surfaces, wind, gradient, tire pressures, pitch and thrust reversing devices, and the like. Our objective is to come up with a more realistic basis for field length requirements. In addition to this important study, we have been engaged, in cooperation with the manufacturing and operating industry and air line pilots, in the continuous evaluation of the statistical approach to the development of performance standards for large airplanes.

I feel confident that the prosecution of this program, without prejudice, will lead to the acceptance of an even sounder set of airworthiness and operating standards than we enjoy today. However, this can only come about with the full and enthusiastic cooperation of all interested groups.

Economics . . .

(Continued from Page 9)

Flight Safety

This type of loss is by far the most serious of all the problems confronting the industry. Any effort to detail the exact cost of a major incident which would be characteristic of all such incidents would be impractical because of the great variation of the cost factors in each incident. However, it is possible to provide a partial estimate of average costs which are applicable to a major incident involving a four-engine transport and which are not to be construed as representative of any particular incident. Passenger liability is based on the $10,000 limitation which is representative of the legal limits of many states, and, further, such settlements are seldom truly representative of factors associated with the incident itself.

1. Equipment Costs*
   Acquisition and Improvement Costs less Depreciation . . . $610,000
   Replacement Costs 950,000
2. Fees and Expenses
   Medical, Transportation, Expenses—Local Area, Miscellaneous 60,000
3. Company Expenses—Payroll Administrative, Public Relations, Medical, Personnel, Legal, Insurance, Economic Control, Traffic and Sales, Passenger Service, Operations, Engineering . . $ 70,000
4. Insurance Costs
   Hull, Workmen's Compensation, Air Mail and Cargo, Other (Var.) $250,000 to 975,000**
5. Revenue Loss
   Equipment—Replacement Time 2 Yrs.
   Revenue $3,000,000
   Less Operating Costs 2,300,000
   Net Income 700,000

Estimate Total . . . $3,365,000

*Sample is for 1948-50 period.

**Insurance costs are so variable with each incident that attempts to arrive at an average have met with little success.

It is clear that the cost of a catastrophic accident is a source of serious economic concern to the aviation industry. It is to be noted that these are only partial costs to the industry because they do not account for the costs of the complete investigation; the costs of other industry representatives at the scene and their participation in technical phases of the investigation. Neither do they account for the untold costs of all the subsequent time-consuming repercussions following the incident.

Since this representative sample was taken, equipment costs, labor costs, as well as other charges, have risen approximately 25%. Today this same representative incident would cost the industry close to $5,000,000. As we look into the future and the advent of jet transports in the $4,000,000 to $5,000,000 bracket and carrying up to 120 passengers, it is readily understandable that the industry must be realistic in its approach to this step forward in our progress. Recent events indicate the wisdom of application of the rule of the elimination of exposure as the true approach to the problems of safety in operation.

Aside from the catastrophic accident, the industry is confronted with the costs of the recurring major incident which involves no passenger injury. An organization such as we have been speaking of may experience about four major accidents each year. The total costs of such incidents will vary from $25,000 to $250,000, depending on the seriousness of the equipment damage. This type of incident may involve a landing in which the nose gear collapses, the costs running from $30,000 to $50,000, or perhaps a hard landing in which major wing damage is incurred and which costs in the neighborhood of $150,000. A fair estimate of the yearly costs for these incidents is between $200,000 and $500,000.

It may appear that these costs are exorbitant, however, they are not exceptional when compared to similar costs in other comparable industry. Other industries are faced with the same problems and many of them, realizing the terrible price which can be paid for the lack of safety, are spending a great deal of time, effort, and money in combatting the problem. We are actually talking about 10% of the net income of the average operating air transport organization and the figure is all at the operating level. How much can we afford to spend to increase our net, say 5%,

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which would be simply cutting the losses in half? It is a good question for the aviation industry to answer and for each company in consideration of its position to determine for itself.

Actually, the industry as a whole has been and is highly safety conscious, as is indicated by the steady improvement in the overall safety of the operation. The great majority of the total effort of maintenance and service engineering is directed toward the three factors of:

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carriers have through the years been conscious of the importance of safety in operations. This is evidenced in the most highly developed and modern overhaul bases in the world. It is evident in the well staffed engineering organizations and the millions of dollars spent each year in meeting the day in and day out requirements of operation. The highly skilled mechanics, electronics specialists, electricians, and others who provide continuous inspection, repair, and service to equipment are entitled to a large share of the credit for the steady progress in the safety of operations.

New Training Techniques

In the flight operations group, new and advanced training techniques are being placed into operation to provide better balance in this important field. With the advent of better facilities and equipment, flight operations will ultimately achieve the objective of making an accident purely accidental.

The industry has reached an acceptable level of safety. The problem now is to maintain a consistent level of safety which will create complete confidence on the part of the traveling public. Ultimately scheduled air transportation will prove to be the safest form of transportation in our civilization. The costs of reaching a higher level than our present experience are entirely justified for two reasons: first, the actual dollar costs of all types of accidents in the industry are too high; and, second, the confidence of the public created by a consistently high level of safety will more than pay for the costs of maintaining it.

The principal gain and benefit will be a more rapid and secure development of the industry in every phase. This will be true whether it be military,

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Memorandum from **ANDERS' "88" SERVICE**
17029 - 21st Ave. Southwest
SEATTLE 66, Washington

TO: All Members and Employees ALPA
FROM: Captain H. B. Anders
SUBJECT: "The Angle"

What is the "Angle"? This question has been asked so often, it occurred to me that you might also be interested. How can we offer you new 1956 automobiles with service policy, factory warranty and guarantees for so much less than the fleet discount prices you may have heard about?

Briefly, here is the answer. I have, as business associates, three personal friends of long standing who are authorized dealers, handling Oldsmobile, Buick and Ford, respectively. These men, upon my recommendation, have agreed to experiment with this type of automobile merchandising, making it available first to Air Line Pilots who are in an excellent position to accept factory delivery. I have insisted, and have received from them, prices which are far less than any so-called fleet discount prices. In addition, I have arranged for all your funds, in payment for your car, to be held by a responsible National Bank, with provisions for release to the dealer only after your automobile is ready for delivery to you at the factory.

There is no "Angle". It is extremely simple. As long as we can operate on this very small margin and give you top service on all transactions, without a loss, we will continue to make these automobiles available to you. In order to assure the success of this venture, we know that we must have the lowest prices, the best order and delivery procedure, maximum financial protection for the customer, and a service and warranty policy to match any in the United States.

There it is!--When you are ready to purchase your new 1956 Oldsmobile, Buick, or Ford, I would like you to consider me as your personal representative and agent. A three cent stamp can save you up to a thousand dollars or more.

Sincerely yours,
Captain H. B. Anders
ALPA No. 2847

P.S. Complete details for ordering your 1956 Oldsmobile, Buick, or Ford will be forwarded to you promptly. Just mail a card to the above address.

private, or commercial operation. The tremendous savings the industry can make in an all-out drive on the problems of aviation safety will benefit the nation as well as the industry. The most beneficial improvements can be made in the areas of engine reliability, traffic control, airports and approach facilities, and the overall understanding of the real problems of labor-management relations.

Safety means "freedom from danger." Its humanitarian application is the preservation of life and protection from injury. Its economic application is the preservation of capital investment and economic stability. It applies with equal force to the good will of an operating company in retaining public acceptance of our product and guaranteeing their willingness to fly with us. It is important to our individual and collective pride, as related to our ability to do a good job and to maintain the highest standards possible within this highly competitive industry. Safety in itself, then, is a comprehensive aspect of the industrial problems. The basic consideration, from a purely economic standpoint, is the preservation of manpower and materials. To that end alone its justification is vitally important to sound business practice.

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Approach Light Use . . .

(Continued from Page 5)

firm decision is made as to the exact altitude where the pilot will discontinue the approach if transition to visual flight is unsatisfactory. Here is the real test of our profession. Let's swallow our pride of personal technique and not try for another fifty feet at critical altitude on any instrument approach. Why not consider the pull-out just as much a part of an instrument approach as the descent and just as routine. In other words, the technique of holding the critical altitude, advancing throttles, gear retraction, maintenance of airspeed and flap reduction should be as mechanical as flying the localizer and glide slope.

The Newark System

At this time, there is only one satisfactory approach light installation in the United States—at Newark Airport. This system is endorsed by ALPA and is composed of 3000 feet of centerline cross bars and stroboscopic condenser discharge lights. Both the 14-foot bars and condenser discharge lights are spaced 100 feet apart. There is a bar 100 feet in length located 1000 feet from the threshold for distance guidance. The heart of this system is the condenser discharge lights which have an ultra high intensity for an extremely short duration but are timed in sequence to give the appearance of a ball of light running down the centerline of the approach twice a second.

In most day and night weather conditions these flashers have four distinct advantages over and above a centerline system of approach lights.

▶ The ultra high intensity of the condenser discharge lights coupled with their characteristic of motion effectively attracts the pilot's field of vision, thus identifying the approach zone usually a few seconds before the bars are visible. This early identification in most cases will give a reassuring indication of whether or not the bars will be visible for transition to visual flight at the critical altitude.

▶ Furthermore, the flashers normally give an early gauge of the airplane's displacement from the centerline during the final part of the approach. Such early indication of the amount of displacement allows extra maneuvering time back to the extended runway centerline, if not precisely in the groove.

▶ At the same time, the flashers give early alignment guidance early in the transition to visual flight.

▶ The extremely short flash duration of the condenser discharge lights does not seriously disturb the eye's darkness adaptation, therefore the intensity of the setting of the steady burning can be decreased, thus lessening the overall blinding effect of the approach light system.

ALPA is continuously pressing for more installations of the Newark type approach lights at all our airports where the approaches are free of obstructions in order that our critical altitudes can be lowered. Also, dual approach light systems of this type (one at each end of the Instrument Runway) particularly at terminal, where traffic is heavy, in order to minimize the hazards of downwind landings or circling from instrument approaches.

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Capt. J. J. Grimm (right) receiving first $25,000.00 claim check from our group occupational disability plan, together with a copy of the federal tax ruling making this payment tax free.

CASE HISTORY:

NAME: Capt. J. J. Grimm

EMPLOYER: Eastern Air Lines

AGE WHEN DISABLED: 36

LENGTH OF SERVICE: Jan. 16/1946

DISABILITY: Optic Neuritis
(70% loss of vision to right eye)

CAUSE: Unknown

MEDICAL EXAMINER: DR. H. K. Edwards
Medical Director
Eastern Air Lines

Canadian Pacific Airlines
Eastern Air Lines
Southern Airways
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